

AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1. (Currently Amended) A method of supporting at least an interlace scan mode, and a sequential scan mode and a dynamic range-widening scan mode in a single imager for use in a video camera wherein the imager includes a CCD portion, the method comprising the steps of:

in response to an interlace scan mode selection signal, causing said CCD portion to generate an interlace scan image signal;

in response to a sequential scan mode selection signal, causing said CCD portion to generate a sequential scan image signal, said sequential scan image signal having $2N$ lines composed of odd lines and even lines, where N is the number of scan lines of an image to be obtained;

synchronizing each pair of odd and even lines of the sequential scan image signal;

doing ordinary image regulations for said synchronized odd and even lines of the sequential scan image signal to provide a first regulated sequential scan image signal of odd lines and a second regulated sequential scan image signal of even lines;

doing the ordinary image regulations for said interlace scan image signal to provide a regulated interlace scan image signal;

in response to said sequential scan mode selection signal, generating a new sequential scan image signal from said first and second regulated sequential scan image signals, which are composed of regulated odd and even line signals in the sequential scan mode;

causing said CCD portion to generate a dynamic range-widening scan image signal of 2N lines in response to a WS mode selection signal, every other line of the dynamic range-widening scan image signal being exposed longer than adjacent lines of said dynamic range-widening scan image signal;

synchronizing each of odd lines of said dynamic range-widening scan image signal with a corresponding even line of said dynamic range-widening scan image signal to provide a first synchronized dynamic range-widening scan image signal of odd lines and a second synchronized dynamic range-widening scan image signal of even lines;

generating a dynamic range-widened image signal from said first and second synchronized dynamic range-widening scan image signals;

doing the ordinary image regulations for said dynamic range-widened image signal to provide a regulated dynamic range-widened image signal;

outputting the regulated interlace scan image signal in said interlace scan mode; and

outputting said new sequential scan image signal in said sequential scan mode; and

outputting said regulated dynamic range-widening image signal in said dynamic range-widening scan mode.

Claim 2 (Cancelled)

3. (Currently Amended) A method of supporting at least a dynamic range-widening scan mode and a sequential scan mode in a single imager for use in a video camera wherein the imager includes a CCD portion, the method comprising the steps of:

in response to a WS mode selection signal, causing said CCD portion to generate a dynamic range-widening scan image signal of $2N$ lines, N being the number of scan lines of an image to be obtained, and every other line of said dynamic range-widening scan - image signal being exposed longer than adjacent lines of said dynamic range-widening scan image signal;

in response to a sequential scan mode selection signal, causing said CCD portion to generate a sequential scan image signal, said sequential scan image signal having $2N$ lines composed of odd lines and even lines;

synchronizing each pair of odd and even lines of the sequential scan image signal;

synchronizing each of odd lines of said dynamic range-widening scan image signal with a corresponding even line of said dynamic range-widening scan image signal to provide a first synchronized dynamic range-widening scan image signal of odd lines and a second synchronized dynamic range-widening scan image signal of even lines;

generating a dynamic range-widened image signal from first and second synchronized dynamic range-widening scan image signals in said dynamic range-widening scan mode;

doing ordinary image regulations for said synchronized odd and even lines of the sequential scan image signal to provide a first regulated sequential scan image signal of odd lines and a second regulated sequential scan image signal of even lines;

doing the ordinary image regulations for said dynamic range-widened image signal to provide a regulated dynamic range-widened image signal;

in response to said sequential scan mode selection signal, generating a new sequential scan image signal from said first and second regulated sequential scan image signals, which are composed of regulated odd and even line signals in the sequential scan mode;

outputting the regulated dynamic range-widened image signal in said dynamic range-widening scan mode; and

outputting said new sequential scan image signal in said sequential scan mode,

wherein said step of doing ordinary image regulations for said synchronized odd and even lines of the sequential scan image signal includes:

in said sequential scan mode, calculating a first vertical contour correction value for each pair of current synchronized odd and even lines of said sequential, scan image signal by using six lines of data including said pair of current synchronized odd and even lines in the center of the six lines; and

performing a vertical contour correction by using said first vertical contour correction value, and

wherein said step of doing the ordinary image regulations for said dynamic range-widened image signal includes:

in said dynamic range-widening scan mode, calculating a second vertical contour correction value for each current line of said dynamic range-widened image signal by using five lines of data including said current line in the center of the five lines; and

performing a vertical contour correction by using said second vertical contour correction value.

4. (Currently Amended) A method as defined in claim 1, wherein
said step of doing ordinary image regulations for said synchronized odd and even lines of the sequential scan image signal comprises the steps of:

in said sequential scan mode, calculating a first vertical contour correction value for each pair of current synchronized odd and even lines of said sequential scan image signal by using ~~6~~ six lines of data including said pair of current synchronized odd and even lines in the center of the ~~6~~ six lines; and
performing a vertical contour correction by using said first vertical contour correction value, and

said step of doing the ordinary image regulations for said interlace scan image signal includes comprises the steps of:

in said interlace scan mode, calculating a second vertical contour correction value for each current line of said interlace scan image signal by using ~~5~~ five lines of data including said current line in the center of the ~~5~~ five lines; and
performing a vertical contour correction by using said second vertical contour correction value.

5. (Currently Amended) A method as defined in claim ~~2~~ 1, wherein said step of doing the ordinary image regulations for said dynamic range-widened image signal comprises the steps of:

in said dynamic range-widening scan mode, calculating a third vertical contour correction value for each current line of said dynamic range-widened image signal by using ~~5~~ five lines of data including said current line in the center of the ~~5~~ five lines; and
performing a vertical contour correction by using said third vertical contour correction value.

6. (Cancelled)

7. (Currently Amended) An imager for use in a video camera, which supports at least an interlace scan mode, and a sequential scan mode and a dynamic range-widening scan mode, the imager comprising:

a CCD means, for generating portion which generates an interlace scan image signal in response to an interlace scan mode selection signal, and generating generates a sequential scan image signal in response to a sequential scan mode selection signal, and generates a dynamic range-widening scan image signal of 2N lines in response to a WS mode selection signal, said sequential scan image signal having 2N lines composed of odd lines and even lines, every other line of the dynamic range-widening scan image signal being exposed longer than adjacent lines of said dynamic range-widening scan image signal, where N is the number of scan lines of an image to be obtained;

synchronizing means for synchronizing a synchronizer which synchronizes each pair of odd and even lines of the sequential scan image signal generated by the CCD means to produce a synchronized odd and even lines of the sequential scan image signal, and synchronizes each of odd lines of said dynamic range-widening scan image signal with a corresponding even line of said dynamic range-widening scan image signal to provide a first synchronized dynamic range-widening scan image signal of odd lines and a second synchronized dynamic range-widening scan image signal of even lines;

a first regulation means for doing regulator which does ordinary image regulations for said synchronized odd and even lines of the sequential scan image signal produced by the synchronizing means to provide a first regulated sequential scan image signal of odd lines and a

second regulated sequential scan image signal of even lines, and ~~doing does~~ the ordinary image regulations for said interlace scan image signal ~~generated by the CCD means~~ to provide a regulated interlace scan image signal;

a first generator, generating means, responsive to said sequential scan mode selection signal, ~~for generating which generates~~ a new sequential scan image signal from said first and second regulated sequential scan image signals ~~provided by the regulation means~~, which are composed of regulated odd and even line signals in the sequential scan mode;

a second generator which generates a dynamic range-widening image signal from said first and second synchronized dynamic range-widening scan image signal;

a second regulator which does the ordinary image regulations for said dynamic range-widening image signal to provide a regulated dynamic range-widened image signal;

a first outputting means for outputting output portion which outputs the regulated interlace scan image signal ~~provided by the regulation means~~ in said interlace scan mode; and

a second outputting means for outputting output portion which outputs said new sequential scan image signal ~~generated by the generating means~~ in said sequential scan mode; and

a third output portion which outputs said regulated dynamic range-widened image signal in said dynamic range-widening scan mode.

Claim 8 (Cancelled)

9. (Currently Amended) An imager for use in a video camera, which supports at least a dynamic range-widening scan mode and a sequential scan mode, the imager comprising:

a CCD portion means ~~for generating~~ which generates a dynamic range-widening scan image signal of $2N$ lines in response to a WS mode selection signal, and generating a sequential scan image signal in response to a sequential scan mode selection signal, N being the number of scan lines of an image to be obtained, every other line of said dynamic range-widening scan image signal being exposed longer than adjacent lines of said dynamic range-widening scan image signal, said sequential scan image signal having $2N$ lines composed of odd lines and even lines;

~~synchronizing means for synchronizing a synchronizer which synchronizes each pair of odd and even lines of the sequential scan image signal generated by the CCD means, and synchronizing each of odd lines of said dynamic range-widening scan image signal generated by the CCD means with a corresponding even line of said dynamic range-widening scan image signal to provide a first synchronized dynamic range-widening scan image signal of odd lines and a second synchronized dynamic range-widening scan image signal of even lines;~~

~~a first generating means for generating generator which generates a dynamic range-widened image signal from said first and second synchronized dynamic range-widening scan image signals provided by the synchronizing means in said dynamic range-widening scan mode;~~

~~a regulation means for doing regulator which does ordinary image regulations for said odd and even lines of the sequential scan image signal synchronized by the synchronizing means to provide a first regulated sequential scan image signal of odd lines and a second regulated sequential scan image signal of even lines, and doing does the ordinary image regulations for said dynamic range-widened image signal generated by the generating means to provide a regulated dynamic range-widened image signal;~~

a second generating means generator, responsive to said sequential scan mode selection signal, for generating which generates a new sequential scan image signal from said first and second regulated sequential scan image signals provided by one regulation means, which are composed of regulated odd and even line signals in the sequential scan mode;

a first outputting means for outputting output portion which outputs the regulated dynamic range-widened image signal provided by the regulation means in said dynamic range-widening scan mode; and

a second outputting means for outputting output portion which outputs said new sequential scan image signal generated by the second generating means in said sequential scan mode, wherein said regulator comprises:

means for, in said sequential scan mode, calculating a first vertical contour correction value for each pair of current synchronized odd and even lines of said sequential scan image signal by using six lines of data including said pair of current synchronized odd and even lines in the center of the six lines;

means for performing a vertical contour correction by using said first vertical contour correction value;

means for, in said dynamic range-widening scan mode, calculating a second vertical contour correction value for each current line of said dynamic range-widened image signal by using five lines of data including said current line in the center of the five lines; and

means for performing a vertical contour correction by using said second vertical contour correction value.

10. (Currently Amended) An imager as defined in claim 7, wherein said ~~regulation means first regulator~~ comprises:

means for, in said sequential scan mode, calculating a first vertical contour correction value for each pair of current synchronized odd and even lines of said sequential scan image signal by using ~~6~~ six lines of data including said pair of current synchronized odd and even lines in the center of the ~~6~~ six lines;

means for performing a vertical contour correction by using said first vertical contour correction value;

means for, in said interlace scan mode, calculating a second vertical contour correction value for each current line of said interlace scan image signal by using ~~5~~ five lines of data including said current line in the center of the ~~5~~ five lines; and

means for performing a vertical contour correction by using said second vertical contour correction value.

11. (Currently Amended) An imager as defined in claim ~~8~~ 7, wherein said ~~regulation means second regulator~~ comprises:

means for, in said dynamic range-widening scan mode, calculating a third vertical contour correction value for each current line of said dynamic range-widened image signal by using ~~5~~ five lines of data including said current line in the center of the ~~5~~ five lines; and

means for performing a vertical contour correction by using said third vertical contour correction value.

Claim 12 (Cancelled)

13. (Currently Amended) An integrated circuit, for use in a video camera, which processes an image signal supplied from a CCD portion of the camera in any one of ~~at least~~ an interlace scan mode, ~~and~~ a sequential scan mode and a dynamic range-widening scan mode, wherein the CCD portion is capable of generating ~~at least~~ interlace scan image signal based on the interlace scan mode, ~~and~~ a sequential scan image signal based on the sequential scan mode and a dynamic range-widening scan image signal of 2N lines based on the dynamic range-widening scan mode, the sequential scan image signal having 2N lines composed of odd lines and even lines, every other line of the dynamic range-widening scan image signal being exposed longer than adjacent lines of said dynamic range-widening scan image signal, where N is the number of scan lines of an image to be obtained, the integrated circuit comprising:

a first synchronizing means for synchronizing synchronizer which synchronizes each pair of odd and even lines of the sequential scan image signal generated by the CCD portion to produce a synchronized odd and even lines of the sequential scan image signal;

a first regulation means for doing regulator which does ordinary image regulations for said synchronized odd and even lines of the sequential scan image signal ~~provided by the synchronizing means~~ to provide a first regulated sequential scan image signal of odd lines and a second regulated sequential scan image signal of even lines, and doing does the ordinary image regulations for said interlace scan image signal generated by the CCD portion to provide a regulated interlace scan image signal;

a first generating means generator, responsive to said sequential scan mode selection signal, ~~for generating which generates~~ a new sequential scan image signal from said first and

second regulated sequential scan image signals ~~provided by the regulation means~~, which are composed of regulated odd and even line signals in the sequential scan mode;

a second synchronizer which synchronizes each of odd lines of said dynamic range-widening scan image signal with a corresponding even line of said dynamic range-widening scan image signal to provide a first synchronized dynamic range-widening scan image signal of odd lines and a second synchronized dynamic range-widening scan image signal of even lines;

a second generator which generates a dynamic range-widened image signal from said first and second synchronized dynamic range-widening scan image signals;

a second regulator which does the ordinary image regulations for said dynamic range-widened image signal to provide a regulated dynamic range-widened image signal;

a first means for outputting output portion which outputs the regulated interlace scan image signal ~~provided by the regulation mean~~ output portion which outputs the regulated interlace scan mode; and

a second means for outputting output portion which outputs said new sequential scan image signal generated by the generating means in said sequential scan mode; and

a third output portion which outputs said regulated dynamic range-widened image signal in said dynamic range-widening scan mode.

Claim 14 (Cancelled)

15. (Currently Amended) An integrated circuit, for use in a video camera, which processes an image signal supplied from a CCD portion of the camera in any one of at least a

dynamic range-widening scan mode and a sequential scan mode, wherein the CCD portion is capable of generating at least a dynamic range-widening scan image signal of $2N$ lines based on the dynamic range-widening scan mode and a sequential scan image signal of $2N$ lines based on the sequential scan mode, N being the number of scan lines of an image to be obtained, every other line of said dynamic range-widening scan image signal being exposed longer than adjacent lines of said dynamic range-widening scan image signal, the integrated circuit comprising:

~~synchronizing means for synchronizing a synchronizer which synchronizes~~ each pair of odd and even lines of the sequential scan image signal generated by the CCD portion, and synchronizing each of odd lines of said dynamic range-widening scan image signal generated by the CCD portion with a corresponding even line of said dynamic range-widening scan image signal to provide a first synchronized dynamic range-widening scan image signal of odd lines and a second synchronized dynamic range-widening scan image signal of even lines;

~~a first a generating means for generating generator which generates~~ a dynamic range-widened image signal from said first and second synchronized dynamic range-widening scan image signals ~~provided by the synchronizing means~~ in said dynamic range-widening scan mode;

~~a regulation means for doing regulator which does~~ ordinary image regulations for said synchronized odd and even lines of the sequential scan image signal ~~synchronized by the synchronizing means~~ to provide a first regulated sequential scan image signal of odd lines and a second regulated sequential scan image signal of even lines, and ~~doing does~~ the ordinary image regulations for said dynamic range-widened image signal to provide a regulated dynamic range-widened image signal;

~~a second generating means generator, responsive to said sequential scan mode selection signal, for generating which generates~~ a new sequential scan image signal from said first and

second regulated sequential scan image signals ~~provided by the regulation means~~, which are composed of regulated odd and even line signals in the sequential scan mode;

a first ~~outputting means for outputting output portion which outputs~~ the regulated dynamic range-widened image signal ~~provided by the regulation means~~ in said dynamic range-widening scan mode; and

a second ~~outputting means for outputting output portion which outputs~~ said new sequential scan image signal ~~generated by the second generating means~~ in said sequential scan mode, wherein said regulator comprises:

means for, in said sequential scan mode, calculating a first vertical contour correction value for each pair of current, synchronized odd and even lines of said sequential scan image signal by using six lines of data including said pair of current synchronized odd and even lines in the center of the six lines;

means for performing a vertical contour correction by using said first vertical contour correction value;

means for, in said dynamic range-widening scan mode, calculating a second vertical contour correction value for each current line of said dynamic range-widened image signal by using five lines of data including said current line in the center of the five lines; and

means for performing a vertical contour correct ion by using said second vertical contour correction value.

16. (Currently Amended) An integrated circuit as defined in claim 13, wherein said ~~regulation means~~ first regulator comprises:

means for, in said sequential scan mode, calculating a first vertical contour correction value for each pair of current synchronized odd and even lines of said sequential scan image signal by using ~~6~~ six lines of data including said pair of current synchronized odd and even lines in the center of the ~~6~~ six lines;

means for performing a vertical contour correction by using said first vertical contour correction value;

means for, in said interlace scan mode, calculating a second vertical contour correction value for each current line of said interlace scan image signal by using ~~5~~ five lines of data including said current line in the center of the ~~5~~ five lines; and

means for performing a vertical contour correction by using said second vertical contour correction value.

17. (Currently Amended) An integrated circuit as defined in claim 14 13, wherein said ~~regulation means~~ second regulator comprises:

means for, in said dynamic range-widening scan mode, calculating a third vertical contour correction value for each current line of said dynamic range-widened image signal by using ~~5~~ five lines of data including said current line in the center of the ~~5~~ five lines; and

means for performing a vertical contour correction by using said third vertical contour correction value.

Claim 18. (Cancelled)

19. (Currently Amended) A method as defined in claim 1, further comprising the steps of:

in response to said sequential scan mode selection signal, adding said first and second regulated sequential scan image signals together to generate a new interlace scan image signal; and

outputting said new interlace scan image signal in said sequential scan mode.

20. (Currently Amended) A method as defined in claim 3, further comprising the steps of:

in response to said sequential scan mode selection signal, adding said first and second regulated sequential scan image signals together to generate a new interlace scan image signal; and

outputting said new interlace scan image signal in said sequential scan mode.

21. (Currently Amended) An imager as defined in claim 7, further for use in a video camera, which supports at least an interlace scan mode and a sequential scan mode, the imager comprising:

a CCD portion which generates an interlace scan image signal in response to an interlace scan mode selection signal, and generates a sequential scan image signal in response to a sequential scan mode selection signal, said sequential scan image signal having $2N$ lines composed of odd lines and even lines, where N is the number of scan lines of an image to be obtained;

a synchronizer which synchronizes each pair of odd and even lines of the sequential scan image signal to produce a synchronized odd and even lines of the sequential scan image signal;
a regulator which does ordinary image regulations for said synchronized odd and even lines of the sequential scan image signal to provide a first regulated sequential scan image signal of odd lines and a second regulated sequential scan image signal of even lines, and does the ordinary image regulations for said interlace scan image signal to provide a regulated interlace scan image signal;

a first generator, responsive to said sequential scan mode selection signal, which generates a new sequential scan image signal from said first and second regulated sequential scan image signals , which are composed of regulated odd and even line signals in the sequential scan mode;

~~adding means for, responsive to said sequential scan mode selection signal, adding an adder which adds said first and second regulated sequential scan image signals together in response to said sequential scan mode selection signal to generate a new interlace scan image signal; and~~

a first output portion which outputs the regulated interlace scan image signal in said interlace scan mode; and

a second output portion which outputs said new sequential scan image signal in said sequential scan mode; and

~~means for outputting a third output portion which outputs said new interlace scan image signal generated by the adding means in said sequential scan mode.~~

22. (Currently Amended) An imager as defined in claim 9, further for use in a video camera, which supports at least a dynamic range-widening scan mode and a sequential scan mode, the imager comprising:

a CCD portion which generates a dynamic range-widening scan image signal of $2N$ lines in response to a WS mode selection signal, and generating a sequential scan image signal in response to a sequential scan mode selection signal, N being the number of scan lines of an image to be obtained, every other line of said dynamic range-widening scan image signal being exposed longer than adjacent lines of said dynamic range-widening scan image signal, said sequential scan image signal having $2N$ lines composed of odd lines and even lines;

a synchronizer which synchronizes each pair of odd and even lines of the sequential scan image signal, and synchronizing each of odd lines of said dynamic range-widening scan image signal with a corresponding even line of said dynamic range-widening scan image signal to provide a first synchronized dynamic range-widening scan image signal of odd lines and a second synchronized dynamic range-widening scan image signal of even lines;

a first generator which generates a dynamic range-widened image signal from said first and second synchronized dynamic range-widening scan image signals in said dynamic range-widening scan mode;

a regulator which does ordinary image regulations for said odd and even lines of the sequential scan image signal to provide a first regulated sequential scan image signal of odd lines and a second regulated sequential scan image signal of even lines, and does the ordinary image regulation for said dynamic range-widened image signal to provide a regulated dynamic range-widened image signal;

a second generator, responsive to said sequential scan mode selection signal, which generates a new sequential scan image signal from said first and second regulated sequential scan image signals, which are composed of regulated odd and even line signals in the sequential scan mode;

adding means for, responsive to said sequential scan mode selection signal, adding an adder which adds said first and second regulated sequential scan image signals together in response to said sequential scan mode selection signal to generate a new interlace scan image signal; and

a first output portion which outputs the regulated dynamic range-widened image signal in said dynamic range-widening scan mode;

a second output portion which outputs said new sequential scan image signal in said sequential scan mode; and

means for outputting a third output portion which outputs said new interlace scan image signal generated by the adding means in said sequential scan mode.

23. (Currently Amended) An integrated circuit as defined in claim 13, further comprising:

adding means for, responsive to said sequential scan mode selection signal, adding an adder which adds said first and second regulated sequential scan image signals together in response to said sequential scan mode selection signal to generate a new interlace scan image signal; and means for outputting and outputs said new interlace scan image signal generated by the adding means in said sequential scan mode.

24. (Currently Amended) An integrated circuit as defined in claim 15, further comprising:

~~adding means for, responsive to said sequential scan mode selection signal, adding an adder which adds said first and second regulated sequential scan image signals together in response to said sequential scan mode selection signal to generate a new interlace scan image signal, and means for outputting and outputs~~ said new interlace scan image signal ~~generated by the adding means~~ in said sequential scan mode.